D2 cont. Step E)

(e) subjecting said organic coatings, films, layers, or residues to a chemical or physical post-rinse treatment subsequent to step (2) capable of removing any residual organic material from said substrates remaining after said solvent rinse.

REMARKS

Claims 3-23 and 25-31 remain in the application. Applicants have amended Claims 5 and 31 to overcome a rejection under 35 USC 112, as described below.

Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The attached page is captioned "**Version with Markings to Show Changes Made**".

With regard to the election of species, Applicants accept the Examiner's interpretation as the election of "other hardened photoresists".

Claims 3-23 and 25-31 are rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

(A) The Examiner contends that the phrase "such as" renders the claims indefinite.

Applicants have determined that Claims 5 and 31 have the objectionable phrase, and have replace the phrase with the phrase --selected from the group consisting essentially of--. Since polynorbornene is not an amorphous fluoropolymer, it is deleted from the list.

Applicants believe that they have found all uses of "such as" in the claims. If, however, there are any claims remaining that have the objectionable phrase, the Examiner is respectfully requested to specifically identify such claim(s).

(B) The Examiner considers that the claims are also indefinite and/or incomplete because it is not clear how the coatings, films, layers or residues can be subjected to a post-rinse treatment when they have already been altered and removed in the previous steps.

As clearly stated in the specification on page 18, lines 22-26:

> "After completion of the conventional rinse treatment of Step 16, the substrate is next treated with one or more post-rinse physical or chemical treatments in one or more chambers, as shown in Step 18, to further facilitate the removal of any residual organic material which remains on the surface of the substrate after the standard rinse step."

Thus, it is possible that the coatings, films, layers or residues are not completely removed in the conventional SO_3 treatment and rinse step. Accordingly, additional processing steps are provided to ensure complete removal of such residual organic material. Applicants submit that, contrary to the Examiner's assertion, the claims are definite and complete.

(C) The Examiner raises the same objection "in some dependent claims, such as claim 25".

Applicants submit that the claims are definite and complete, for the reasons given above.

Reconsideration of the rejection of Claims 3-23 and 25-31, as amended, under 35 USC 112, second paragraph, is respectfully requested.

Applicants acknowledge their obligation, as pointed out by the Examiner in paragraph 7 of the Office Action.

Claims 3-23 and 25-31 are rejected under 35 USC 103(a) as being unpatentable over Gupta et al (U.S. Patent 5,037,506) in view of Hawley's Condensed Chemical Dictionary, in view of Mayer et al (U.S. Patent 3,893,869) and further in view of Nachshon (U.S. Patent 5,114,834), Engelsberg ("Laser-Assisted Cleaning Proves Promising"), WO 97/17164, WO 95/07152, Engelsberg (U.S. Patent 5,024,968) and Engelsberg et al (U.S. Patents 5,643,472 and 5,531,857).

Gupta et al, discussed by Applicants on page 7, line 8 to page 8, line 12 of the specification, disclose the use of gaseous sulfur trioxide to remove various organic coatings, polymerized photoresist, and especially implant and deep-UV hardened photoresist layers, during the manufacture of semiconductor or ceramic devices.

The Examiner states that Gupta et al teach a method "substantially the same as claimed except for the last laser cleaning step".

Applicants strenuously disagree. The steps disclosed by the Gupta et al patent are recited in the preamble of Claim 31 as steps (1) and (2). Applicants' invention is directed to an improvement over the Gupta et al process (that patent and the present application are both assigned to the same assignee, Anon, Inc. and there is a common inventor - Ahmad Waleh - in both the Gupta et al patent and the present application). The only two steps disclosed by Gupta et al is the exposure to sulfur trioxide and subsequent rinsing. There is absolutely not the slightest disclosure or suggestion of (1) Applicants' claimed step (b) (subjecting the organic coatings, films, layers, or residues of step (a) to a precursor chemical or physical treatment prior to step (1)) or of (2) Applicants' claimed step (e) (subjecting the organic coatings,

films, layers, or residues to a chemical or physical post-rinse treatment subsequent to step (2)).

Accordingly, the burden is on the Examiner to provide references that disclose or suggest Applicants' steps (b) and (e) of pre-treatment and post-rinse treatment, respectively. However, not one of the references cited by the Examiner discloses or suggests either of these steps in conjunction with sulfur trioxide treatment.

The Examiner cites Engelsberg, Engelsberg et al, WO 97/17164, WO 95 07152, and Nachshon as purportedly showing "a precise cleaning and photoresists removal" as being conventional in the art.

However, there is not the slightest disclosure or suggestion that such laser cleaning is used in conjunction with a sulfur trioxide treatment. Indeed, these references all suggest complete removal of the resist by the disclosed procedures. There would be no incentive for one skilled in the art to include such a procedure as part of Applicants' claimed process, including sulfur trioxide treatment.

The Examiner cites Hawley's Dictionary to show that nitrous oxide is a part of the air.

The amount of nitrous oxide in air is "0.000,05 % by Vol.". This is such a trivial amount that any reaction as a result of this "chemically active process gas" would take an extraordinarily long time to complete. The Examiner is clearly straining at gnats to contend that a recitation of a chemically active process gas, nitrous oxide, is met by the simple use of air. Since nitrous oxide is a mild anesthetic ("laughing gas"), then to follow the Examiner's line of reasoning, we should all be in a constant state of anesthesia, due to the presence of nitrous oxide in the air. This, of course, is nonsensical.

The Examiner cites Mayer et al for showing the use of ultrasonic-megasonic energy during liquid treatment of a semiconductor wafer.

However, there is not the slightest disclosure or suggestion that the use of ultrasonic-megasonic energy is used in conjunction with a sulfur trioxide treatment. Indeed, all this reference fairly suggests is ***cleaning*** minute particles of dirt and grease from the surface of semiconductors. There is no disclosure of "liquid treatment" of semiconductor wafers, other than cleaning the surfaces thereof. Further, there is no disclosure that such liquid treatment may be used to remove hardened photoresist residues. Thus, there would be no incentive to include such a procedure as part of Applicants' claimed process, including sulfur trioxide treatment.

The Examiner has clearly indulged in the impermissible practice of extracting bits and pieces from several references to cobble together a facsimile of Applicants' claims, without regard to the teachings as a whole. The Examiner is reminded that

> "[t]he test for obviousness is not whether the features of one reference may be bodily incorporated into another reference. . . . Rather, we look to see whether combined teachings render the claimed subject matter obvious."

In re Wood, 202 USPQ 171, 174 (C.C.P.A. 1979).

The claim must be considered ***as a whole***. The inclusion of separate references in a rejection to represent each of the different features described in the claims of the application is a sign that the Examiner is attempting to piece together the claimed invention using the claims as a guide. That is, the Examiner is using Applicants' claims as an instruction manual to find the appropriate prior art that might render the claims obvious. In this process, the Examiner has lost sight as to the real issue: whether it would have been obvious to combine with references ***without*** having access to the instant application. As stated by the Federal Circuit,

> "although Graham v. John Deere Co. . . . requires that certain factual inquiries, among them the differences between the prior art and the claimed invention, be conducted to support a determination of the issue of obviousness, the actual determination of the issue requires an evaluation in the light of the findings in those inquiries of the obviousness of the claimed invention as whole, not merely the differences between the claimed invention and the prior art."

Lear Siegler, Inc. v. Aeroquip Corp., 221 USPQ 1025, 1033 (Fed. Cir. 1984).

Thus, it is not correct for the Examiner merely to focus on the differences between the prior art and the claimed invention, and then to state that the differences themselves or individually are obvious. The claimed invention ***as a whole*** is to be considered. Further, it is impermissible for the Examiner to use the application itself as the basis or reason for formulating the obviousness rejection. As the Federal Circuit has stated:

> "It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that '[o]ne cannot use hindsight reconstruction to pick and choose

> among isolated disclosures in the prior art to deprecate the claimed invention.'"

In re Fritch, 23 USPQ 2d 1780, 1783–84 (Fed. Cir. 1992)

Not only the claimed invention as a whole must be considered, but also the prior art as a whole must be considered. See, for example, *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 221 USPQ 481, 488 (Fed. Cir. 1984), in which the Court stated:

> "The '315 patent specifically stated that it disclosed and claimed a combination of features previously used in two separate devices. That fact alone is not fatal to patentability. The claimed invention must be considered as a whole, and the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination."

Note also a decision by the Federal Circuit in *Akzo N.V. v. United States International Trade Commission*, 1 USPQ 2d 1241, 1246 (Fed. Cir. 1986), cert. denied, 482 U.S. 909 (1987), in which the Court stated:

> "[P]rior art references before the tribunal must be read as a whole and consideration must be given where the references diverge and teach away from the claimed invention. . . . Moreover, appellants cannot pick and choose among individual parts of assorted prior art references 'as a mosaic to recreate a facsimile of the claimed invention.'"

The foregoing case law is cited to remind the Examiner that the references ***as a whole*** must also be considered, even as the claimed invention ***as a whole*** must be considered. Applicants contend that the Examiner has ignored the teachings of the references as a whole in finding obviousness in Applicants' claimed invention.

Gupta et al fail to disclose any pre-treatment or any post-treatment steps. The Examiner is simply tacking on other references that purportedly show aspects of Applicants' pre-treatment or post-treatment steps. However, simply tacking on these references that bear no relationship to SO_3 treatment is in error, as discussed above. As an example, megasonic post-treatment will ***not*** remove any hardened photoresist residues in the absence of SO_3 treatment of the photoresist (or some other treatment that makes the photoresist amenable to removal by megasonics), and there is not the slightest disclosure or suggestion in that reference that megasonic treatment would so remove hardened photoresist residues at all.

Applicants have recognized that (1) SO_3 does not necessarily completely remove hardened photoresist and (2) that pre-treatment and/or post-treatment will help remove anything not removed by SO_3 and subsequent rinse.

For the foregoing reasons, the Examiner has failed to cite references that disclose or suggest Applicants' pre-treatment step (b) and post-rinse treatment step (e) in combination with exposure to sulfur trioxide.

Reconsideration of the rejection of Claims 3-23 and 25-31, as amended, under 35 USC 103(a) as being unpatentable over Gupta et al in view of Hawley's Condensed Chemical Dictionary, in view of Mayer et al and further in view of Nachshon, Engelsberg ("Laser-Assisted Cleaning Proves Promising"), WO 97/17164, WO 95/07152, Engelsberg, and Engelsberg et al is respectfully requested.

The foregoing amendments and arguments are submitted to place the application in condition for allowance. The Examiner is respectfully requested to take such action. If the Examiner has any questions, he is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,
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October 24, 2002

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 5 and 31 have been amended as follows:

5. (Amended) The method of Claim 4, wherein said organic polymer is selected from the group consisting of polyimides, copolyimides, polyamides, polyamide-imides, fluorinated polyimides, poly(arylenethers), fluorinated poly(arylenethers), perfluorinated alkylene oxides, parylene (N, C, D, or F type), poly(phenylquin-oxalines), poly-naphthalene, poly-fluorinated napththalene, benzocyclobutene (BCB), amorphous fluoropolymers[, such as] selected from the group consisting of polytetrafluoroethylene, perfluorocyclobutane aromatic ether (PFCB), [polynorbornene,] and fluorinated carbon.

31. (Amended) An improved method for partially or completely removing organic coatings, films, layers or residues from a substrate, said method comprising:

(1) subjecting said organic coatings, films, layers, or residues to a vapor consisting essentially of water-free gaseous sulfur trioxide for a period of time, said substrates being maintained at a temperature in the range from about room temperature to 400°C; and

(2) subjecting said organic coatings, films, layers, or residues to a solvent rinse;

wherein the improvement comprises the following steps:

(a) providing organic coatings, films, layers and residues that are selected from the group consisting of polymerized photoresists, paints, resins, single and multilayer organic polymers, organo-metallic complexes, positive optical photoresist, negative optical photoresist, electron-beam photoresists, X-ray photoresists, ion-beam photoresists, ion-implanted photoresists, and other hardened photoresists, wherein said organic polymers are selected from the group consisting of polyimides, copolyimides, polyamides, polyamide-imides, fluorinated polyimides, poly(arylenethers), fluorinated poly(arylenethers), perfluorinated alkylene oxides, parylene (N, C, D, or F type), poly(phenylquin-oxalines), poly-naphthalene, poly-fluorinated napththalene, benzocyclobutene (BCB), amorphous fluoropolymers[, such as] selected from the group consisting of polytetrafluoroethylene, perfluorocyclobutane aromatic ether (PFCB), [polynorbornene,] and fluorinated carbon, and wherein said substrate consists of at least one portion of a device selected from the group consisting of semiconduc-

tor devices and wafers, liquid crystal display devices, flat-panel displays, printed circuit boards, magnetic read/write heads, thin-film read/write heads;

(b) subjecting said organic coatings, films, layers, or residues of step (a) to a precursor chemical or physical treatment prior to step (1) capable of facilitating the reaction of said sulfur trioxide with the organic coatings, films, layers or residues to be removed;

(c) carrying out said step (1) so that said water-free, gaseous sulfur trioxide reacts with said organic coatings, films, layers, and residues to form physically or chemically altered organic material;

(d) carrying out said step (2) to remove said altered organic material from said substrates; and

(e) subjecting said organic coatings, films, layers, or residues to a chemical or physical post-rinse treatment subsequent to step (2) capable of removing any residual organic material from said substrates remaining after said solvent rinse.